

WHAT IS CLAIMED IS:

1. A code synchronous timing determining method comprising:

5 acquiring correlation values of a code included in a CDMA reception signal and an internal code prepared in a receiving station at plural timings in each of a plural given time widths included in a given period;

storing the correlation values corresponding to the plural timings;

10 retrieving a maximal correlation value from the stored correlation values to register a retrieved timing corresponding to the maximal correlation value as a maximal timing;

15 scanning the stored correlation values in a given direction to detect at least one minimal correlation value to register a retrieved minimal timing corresponding to the detected minimal correlation value;

20 extracting at least one correlation value selected from the correlation values stored at plural timings having a specified time interval from the maximal timing to the minimal timing as a high correlation value candidate; and

25 holding timing data corresponding to the high correlation value candidate as timing information of code synchronism.

2. The code synchronous timing determining method

according to claim 1, wherein the retrieving of the maximal timing is performed by:

comparing the correlation value at the timing of notice with a predetermined value,

5 detecting whether or not the correlation value has a maximal value when the correlation value is judged to be larger than the predetermined value, and

registering the timing of notice as the maximal timing when judged to have a maximal value.

10 3. The code synchronous timing determining method according to claim 2, further comprising:

setting a retrieval time width for detecting a maximum timing at the timing of notice defined in each of said given time widths; and

15 determining the maximum timing as the maximal timing within the set retrieval time width.

4. The code synchronous timing determining method according to claim 2, further comprising:

20 terminating the process relating to the correlation value at a timing of notice, when the correlation value at the timing of notice is smaller than the predetermined value as a result of comparison between the correlation value and the predetermined value.

25 5. The code synchronous timing determining method according to claim 2, further comprising:

determining, as the predetermined value, a minimum

correlation value of the high correlation timing candidates preset for timing determination of code synchronism.

5 6. The code synchronous timing determining method according to claim 2, further comprising:

determining, as the predetermined value,  
a specified threshold value.

7. The code synchronous timing determining method according to claim 2, further comprising:

10 determining, as the specified threshold value,  
a threshold value corresponding to a noise.

8. The code synchronous timing determining method according to claim 3, further comprising:

15 extracting the correlation value by comparison  
between the stored correlation value and predetermined  
value.

9. The code synchronous timing determining method according to claim 8, further comprising:

20 holding the timing information of the stored  
correlation value by replacing the same with the timing  
information of the held high correlation candidate,  
when the stored correlation value is determined as  
being larger than the predetermined value as a result  
of comparison.

25 10. The code synchronous timing determining method according to claim 8, further comprising:

terminating the process relating to the stored

correlation value when the stored correlation value is determined as being larger than the predetermined value as a result of comparison.

11. The code synchronous timing determining method according to claim 8, further comprising:

determining, as the predetermined value, the minimum correlation value of the high correlation candidates extracted from outside range of the retrieval time width.

12. The code synchronous timing determining method according to claim 8, further comprising:

determining, as the predetermined value, a specified threshold value.

13. The code synchronous timing determining method according to claim 8, further comprising:

determining, as the specified threshold value, a threshold value corresponding to a noise.

14. The code synchronous timing determining method according to claim 1, further comprising:

terminating a process with respect to correlation values relating to the maximal timing, when the minimal timing is registered.

15. A code synchronous timing determining method comprising:

acquiring plural correlation values showing correlation between a code assigned in a specified channel and a code included in a CDMA reception signal

together with the time data showing the timing of  
obtaining the correlation values;

storing the acquired plural correlation values in  
association with the corresponding time data;

5 detecting, at a timing of notice, a timing having  
a largest correlation value in the stored plural  
correlation values within a predetermined time width;

registering the largest timing detected at the  
timing of notice as the maximal timing;

10 comparing each correlation value stored in the  
forward and backward directions from the maximal timing  
with a predetermined value;

registering a timing when the associated  
correlation value is detected to be less than a minimum  
15 correlation value as the minimal timing;

extracting at least one high correlation value  
from the correlation values obtained in the every  
specified time interval from the maximal timing till  
the minimal timing; and

20 registering a timing data corresponding to the  
extracted high correlation value as candidate timing  
data for code synchronism.

16. The code synchronous timing determining method  
according to claim 15, further comprising:

25 stopping the registering of a new maximal timing,  
once the maximal timing is registered, and until the  
minimal timing is registered.

17. A code synchronous timing determining apparatus comprising:

5 a correlator configured to acquire correlation values of a code included in a received CDMA signal and an internal code provided in the apparatus at plural timings in each of a plural given time widths included in a given period;

a storage circuit configured to store the correlation values corresponding to the plural timings;

10 a first registering unit configured to retrieve at least one timing having a maximal value among stored plural correlation values and to register the one timing as a maximal timing;

15 a second registering unit configured to scan each correlation value in the forward and backward directions from the maximal timing to detect a minimal correlation value and to register a timing corresponding to the minimal correlation value as a minimal timing;

20 an extractor configured to extract at least one correlation value having a value of a predetermined value or more from the correlation values stored at plural timings having a specified timing interval from the maximal timing to the minimal timing, as a high correlation value candidate; and

25

a holding unit configured to hold a timing corresponding to the high correlation value candidate

as timing information of code synchronism.

18. The code synchronous timing determining apparatus according to claim 17, wherein the first registering unit includes a comparing circuit  
5 configured to compare whether or not the correlation value at a timing of notice is larger than a predetermined value, a detecting circuit configured to detect whether or not the correlation value has a maximal value when the correlation value is judged to  
10 be larger than the predetermined value, and a registering circuit configured to register the timing of notice as the maximal timing when judged to have a maximal value.

19. The code synchronous timing determining apparatus according to claim 18, further comprising  
15 a setting circuit configured to set a retrieval time width in a predetermined width before and after the timing of notice for retrieving the maximal timing, wherein the maximal timing is retrieved within the set  
20 retrieval time width.

20. The code synchronous timing determining apparatus according to claim 18, further comprising a control circuit configured to terminate a process relating to the correlation value at the timing of  
25 notice when the correlation value at the timing of notice is smaller than the predetermined value as a result of comparison between the correlation value and

the predetermined value.

21. The code synchronous timing determining apparatus according to claim 18, wherein the predetermined value is a minimal correlation value of the high correlation timing candidates preset for timing determination of code synchronism.

22. The code synchronous timing determining apparatus according to claim 18, wherein the predetermined value is a specified threshold value.

23. The code synchronous timing determining apparatus according to claim 18, wherein the specified threshold value is a threshold value corresponding to a noise.

24. The code synchronous timing determining apparatus according to claim 19, wherein the high correlation value candidate is extracted by comparison between a registered high correlation value candidate and a correlation value detected as a new candidate by the comparing circuit.

25. The code synchronous timing determining apparatus according to claim 19, further comprising a control unit to replace first timing information of the stored correlation value with second timing information of the held high correlation candidate and holding first the timing information when the stored correlation value is larger than the predetermined value as a result of comparison by the comparing



circuit.

26. The code synchronous timing determining apparatus according to claim 25, further said control unit further comprising a termination unit configured to terminate a process relating to the stored correlation value when the stored correlation value is smaller than the predetermined value as a result of comparison by the comparing circuit.

27. The code synchronous timing determining apparatus according to claim 19, wherein the predetermined value is the minimal correlation value of the high correlation candidates extracted from outside range of the retrieval time width.

28. The code synchronous timing determining apparatus according to claim 19, wherein the predetermined value is a specified threshold value.

29. The code synchronous timing determining apparatus according to claim 19, wherein the specified threshold value is a threshold value corresponding to a noise.

30. The code synchronous timing determining apparatus according to claim 19, wherein the control unit includes an inhibit unit configured not to register a new maximal timing, once the maximal timing is registered, until the minimal timing is registered.

31. A CDMA receiving apparatus comprising:

a receiver configured to receive a CDMA signal;

a first correlator configured to generate code correlation values corresponding to a specified code from an output of the receiver;

5 a storage device configured to store the correlation values;

10 a code synchronous timing determining device configured to determine plural code synchronous timing candidates by reading the correlation values stored in the storage device, the code synchronous timing determining device including a time width designating unit configured to designate a limit number of correlation values data of the correlation values stored in said storage device, and candidate extracting unit configured to extract high correlation values as  
15 code synchronous timing candidates from the limit number of correlation values designated by said time width designating unit;

20 a control device configured to issue a control signal for controlling code synchronism with the CDMA signal received by using the code synchronous timing candidates obtained from the code synchronous timing determining device;

25 plural second correlators configured to issue correlation values at plural timings by the code synchronous timing candidates; and

a combining device configured to sum up the correlation values from the plural second correlators.

32. A code synchronous timing determining apparatus comprising:

5 a correlator configured to acquire correlation values of a code included in a CDMA reception signal and an internal code provided in the apparatus at plural timings in each of a plural given time widths included in a given period;

a storage circuit configured to store the correlation values corresponding to the plural timings;

10 a scanning element to scan the stored correlation values; and

a high correlation candidate holding element configured to hold an identifier and a correlation value at the timing of detection of a higher correlation value of a predetermined value or more by scanning by the scanning element,

15 wherein said scanning element includes:

a holding circuit having a number of data holding stages configured to hold timing information at the plural timings in a time sequence order acquired in relation to the correlation values, the number of the data holding stages being defined to correspond to a limit number of correlation values data of the correlation values stored in said storage circuit;

25 a registering circuit configured to retrieve a timing corresponding to a correlation value having at least one maximal value from the information at the

plural timings held in the holding circuit, to register the timing as maximal timing; and

candidate extracting unit configured to extract high correlation values as code synchronous timing  
5 candidates from the limit number of correlation values held in said holding circuit.